

VME Intensity Monitor - Task #13919

Fix scaling for ring pick MPS thresholds

09/23/2016 10:46 AM - John Diamond

Status:	Assigned	Start date:	09/23/2016
Priority:	Normal	Due date:	
Assignee:	John Diamond	% Done:	80%
Category:	MPS	Estimated time:	8.00 hours
Target version:		Spent time:	10.00 hours
Description			
The PXIE ring pickup MPS thresholds never made sense because they are set in ADC integrated counts. Ning has provided a method for scaling to amps -			
 Intensity Threshold (P:MPRLT , P:MPRUT):			
 I_THR: Register Value for thresholds.			
Threshold_Setting: D80 Setting (common unit, E10?) for thresholds.			
GW: Raw Gate Width Reading			
 Revised:			
$I_THR = \log_base_C3((Threshold_Setting / (GW * C5) - C4) / C1) * GW / C2$			
 C1 = 0.3660774			
C2 = 0.0003773625			
C3 = 1.7			
C4 = -0.268996			
 C5 = 4.9932073			
C6 = 0			
 ---- Note: the outside parts of this formula can be done on D80, Otherwise, leave D80 scaling to 1.			

History

#1 - 09/23/2016 10:50 AM - John Diamond

The above formula scales to E10 not Amps.

#2 - 09/23/2016 11:03 AM - John Diamond

Gate Width should be the gate width as read from the digitizer in raw ADC clock ticks.

#3 - 09/23/2016 12:56 PM - John Diamond

I came up with the inverse function as -

```
Threshold_Setting = (C5 * GW) * (C4 + C1 * C3^( (C2 * I_THR) / GW ))
```

#4 - 09/27/2016 09:13 PM - John Diamond

- % Done changed from 0 to 80

Implemented support for scaling the MPS upper/lower thresholds inside the front end.
Created a CLI command for specifying scaling parameters:

```
vmeintMPSThresholdScaleFilterSet deviceId, scaleMethodStr, c1Str, c2Str, c3Ctr, c4Str, c5Str, c6Str
```

- deviceId is the intensity device ID
- scaleMethodStr specifies what kind of scaling should be done. The default method is "linear". For the PXIE ring pickups this parameter should be "pxie_ring_pickup".
- c1Str .. c6Str are the scaling coefficients (these are floating-point parameters, they must be passed as strings e.g. "2.0")
 - **linear:** $C1 * x / C2 + C3$

◦ `pxie_ring_pickup: log_base_C3((x / (GW * C5) - C4) / C1) * GW / C2`

#5 - 09/27/2016 10:47 PM - John Diamond

Add a line of output to `vmeintShow` to display the MPS threshold scaling information:

```
Intensity Devices -
  Toroid
  Device ID: 0
  ADC ID: 0, channel: 0
  Readouts: BBB disabled, raw disabled
  DAQ Source: 0
  MPS: Enabled      NOT TRIPPED
        Lower: NaN, Upper: NaN, Edge Threshold: 4096
        Threshold Scaling: log_base_C3( ( x / (gate_width * C5) - C4 ) / C1 ) * gate_width / C2, where C
1 = 0.366 C2 = 0.000377 C3 = 1.7 C4 = -0.26 C5 = 4.99 (pxie_ring_pickup)
        Pulse Direction: 0 (-)
        Pulse Width: 0 ns
        Time Check: Enabled, margin: 128 clock ticks
```